



Translation

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference O.Z. 6070-WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP2003/007543	International filing date (day/month/year) 11 July 2003 (11.07.2003)	Priority date (day/month/year) 22 August 2002 (22.08.2002)
International Patent Classification (IPC) or national classification and IPC C07C 11/09, 1/20		
Applicant OXENO OLEFINCHEMIE GMBH		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>2</u> sheets.</p>	
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>	

Date of submission of the demand 09 December 2003 (09.12.2003)	Date of completion of this report 12 November 2004 (12.11.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP2003/007543

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed

☒ the description:

pages 1-15, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

☒ the claims:

• pages _____, as originally filed
 pages _____, as amended (together with any statement under Article 19
 pages _____, filed with the demand
 pages 1-9, filed with the letter of 25 August 2004 (25.08.2004)

☒ the drawings:

pages 1/3-3/3, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

☐ the sequence listing part of the description:

pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP 03/07543

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-9	YES
	Claims		NO
Inventive step (IS)	Claims	1-9	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-9	YES
	Claims		NO

2. Citations and explanations

1. Amendments

The new claims 1-9 submitted with the letter of 25 August 2004 are consistent with PCT Article 34(2)(b):

The additional features in the new claim 1 d) with respect to the separation of the decomposition product in a column and the return of the resulting bottom product are based on page 5, lines 12-17 and page 9, lines 21-30 of the original description.

The separation of C4 oligomers, MSBE and TBA from the fraction a) (new claims 2 and 3) is supported by page 5, line 11 and page 6, line 28 to page 7, line 5 of the original description.

2. This report makes reference to the following document:

D1: US5567860.

3. Novelty

3.1 D1 shows (see figure 1 and column 10 as well as the example) a method for producing isobutene by means of the acid-catalyzed decomposition of methyl tert-butyl ether (MTBE) by separating a starting mixture containing MTBE, MSBE, dimethyl ether (DME), C4 hydrocarbons, methanol, TBA and C4 oligomers through distillation into an overhead product containing C4 hydrocarbons, MeOH, DME, a bottom product of C4 oligomers and into a side stream (48) containing MTBE and MSBE (see debutanizer column 24).

The MTBE in the side stream (48) is separated in a decomposition zone (52) into methanol and isobutene. A stream containing isobutene is separated as an overhead product in an isobutene column (58) and then further purified. The products (MTBE, MSBE, and methanol) obtained in the bottom product of the isobutene column (58) are separated in a further column (62) into an overhead product containing MTBE, MSBE and methanol and into a bottom product containing methanol. The overhead product passes back into column (24) and the bottom product containing methanol passes into an upstream etherification unit (20) (see figure 1 and column 10, lines 34-53).

3.2 The subject matter of claim 1 differs from this known method essentially in that during the separation of the starting mixture into fractions a) and b), no separate removal of a bottom product (C4 oligomers) and of a side stream (MTBE, MSBE) takes place, but rather the fraction a) contains these

products together. Furthermore, the MTBE and methanol-containing bottom product of the separation of the decomposition product of c) passes back into the starting mixture, which means that the methanol is not separated from the bottom product in a further column as in D1 (62).

3.3 Therefore, the subject matter of claim 1 and of claims 2-9, which are dependent thereon, is novel (PCT Article 33(2)).

4. Inventive step

D1 is regarded as the prior art closest to the subject matter of claim 1.

The return of the methanol-containing bottom product obtained in the separation of the decomposition product of c) into the starting mixture leads the methanol resulting from the MTBE decomposition to be separated in the column in order to fractionate the starting mixture. Prior separation of the methanol from the bottom product through an additional separation step is no longer necessary.

Therefore, the problem to be solved by the present invention can be regarded as that of providing an alternative method for producing isobutene from MTBE.

The prior art neither disclosed nor rendered obvious the modification of the method described in D1 to the effect that the decomposition methanol is separated by returning the bottom product of the decomposition product of c) into the starting

mixture in the column in order to fractionate the starting mixture.

Therefore, the solution proposed in independent claim 1 of the present application and in claims 2-9, which are dependent on claim 1, involves an inventive step (PCT Article 33(3)).

5. Observation

The present wording of dependent claims 2 and 3 gives the impression that the C4 oligomers, MSBE and TBA are completely separated from the fraction a), whereas the corresponding passages of the description (page 5, line 11 and page 6, line 28 to page 7, line 5) indicate that only a portion of these products (high boilers) is removed.